REMARKS

In the January 4, 2010, Office Action, the Patent Examiner made the Office Action final, indicating in paragraph 8 of the Office Action that "Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action." That, however, is not accurate.

More specifically, independent claims 55, 63 and 64 were not amended in the prior amendment and yet a new basis for rejection of those three independent claims was presented in the January 4, 2010, Office Action. As such, the finality of the January 4, 2010, Office Action is premature.

Consequently, in the event that the instant application does not place this case into condition for allowance, Applicant respectfully requests that the Patent Examiner withdraw the finality of his prior Office Action.

Independent claims 65 and 66 are presented at this time for reconsideration and allowance by the Patent Examiner. Additionally, new claims 67 and 68 are presented at this time. Claims 67 and 68 are apparatus claims, but correspond respectively to claims 65 and 66. The other independent claims in this application have been canceled in order to expedite prosecution.

The present invention relates to a method for distance measurement in which an electromagnetic pulse is transmitted by a transmitter and the return echo pulse, including any noise, is detected by a receiver. The noise is measured using the receiver at specific points in time which are determined at least by one threshold of the receiver which lies in the noise.

A plurality of electromagnetic pulses are transmitted by the transmitter and averaging the points in time at which the threshold of the receiver is exceeded and points in time at which the threshold of the receiver has fallen below. The average value is then integrated into an

amplitude function. A detection threshold is then applied to the amplitude function to detect changes of noise caused by the signal pulses and in which the respective associated object for which the distance is determined in the amplitude function is for the signal pulses on the basis of at least one point in time at which the detection threshold is passed through.

Claim 65, i.e. the first method claim, incorporates the limitations of previous claims 33, 36, 37, 43, 44, 46 and 47 in the published patent application. Claim 66 is essentially the same as claim 65 except that the evaluation of the signals passing through the threshold is reversed. Although both claims speak for themselves, the key to Applicant's invention lies in the last three paragraphs of claim 65 or 66. More specifically, the integration process together with the so-called amplitude function is best described in paragraphs [0110] and [0115]-[0118] of the A1 publication. Please also see paragraph [0122] of the A1 publication.

As is clear from this portion of the A1 publication, the method of the present invention utilizes the fact that the signal 15 (see FIGS. 5A-5F) to be detected causes a shift of the analog measurement 37 into the positive rather than the pure noise measurement. This shift in turn leads to the effect that the signal shows up in the amplitude function as a signal which can be detected by applying to the amplitude function a detection threshold as best shown in FIG. 5F.

A primary advantage of Applicant's invention is that the calculations performed by the device are simple and, in a mathematical sense, equivalent to forming an amplitude function and applying that amplitude function to a threshold, this being done by software running in the device, i.e. the amplitude function is a "software function" and the threshold is a "software threshold".

Method claims 65 and 66, as well as the new apparatus claims 67 and 68, are very specific and clearly define that the average value of the points in time is integrated into an

amplitude function and that the detection threshold is applied to that amplitude function. As discussed below, the prior art cited by the Patent Examiner simply fails to teach or suggest this aspect of Applicant's invention.

The Patent Examiner, however, has rejected previously submitted claims 65 and 66 as unpatentably obvious over U.S. Patent Application Publication No. 2003/0035097 to Lai when combined with Ogawa and U.S. Patent Application Publication No. 2004/0075823 to Lewis. As discussed below, Applicant respectfully submits that this basis for rejection should be withdrawn.

More specifically, the Lai patent admittedly teaches a laser range finder which, like most range finders, uses the time of flight (TOF) to measure the distance between the device and the distant object. Lai teaches transmitting a plurality of pulses of electromagnetic radiation from the transmitter and detecting the reflected signal pulses by the receiver. The pulses above a threshold 80 are detected at time T_d (FIG. 3) and the extraneous noise signals 7 are ignored. Lai also teaches adjusting the threshold in order to eliminate false readings caused by the noise 70.

While Lai certainly addresses the same problem as Applicant, namely compensation for noise in a TOF range finder, Lai does so in a different fashion. Specifically, in the instant application the threshold lies in the noise and in which the crossing of the threshold in the noise at specific points in time is integrated into the amplitude function 29. There is simply no suggestion, whatsoever, in the Lai patent of integrating the average points of time into an amplitude function in the fashion disclosed and positively claimed in claims 65-68.

The secondary references to Lewis and Ogawa do not cure this deficiency of Lai. Rather, in the Lewis reference, Lewis merely teaches a method of distance measurement utilizing the TOF principle. Lewis achieves this by creating a digital curve of the received echo signals

together with the accompanying noise at each of different comparison thresholds. Lewis then adds the different digital curves or histograms together for each sequential TOF electromagnetic pulse in order to obtain the final digital curve having the true signal clearly differentiated from the random background noise. This is explained in paragraph [0087] of the Lewis reference wherein Lewis discusses utilizing a control engine 20 which aggregates the histogram information at each threshold to create a composite waveform that serves as a digital representation of the waveform received by the laser diode 26.

Lewis is quite different from Applicant's invention. In Applicant's invention, the claims clearly define that the reflected pulse is below the noise level and also that the noise level, which contains the desired reflection pulse, is measured only at specific points of time determined at which at least one threshold of the receiver in the noise is passed through. The Patent Examiner will also appreciate that the Lewis reference requires a great deal more computational power than in the instant invention.

Lastly, the Ogawa patent does not cure this deficiency of Lewis even when combined with Lai. Specifically, as described in paragraph [0050] of the Ogawa publication, Lewis describes how a relatively low signal pulse lying slightly above the threshold Vth is achieved. The Ogawa reference is only able to distinguish between pulses in which the differences between the two pulses in time are below or above a predetermined value Tpth2; see FIG. 8B of Ogawa. That, however, is not Applicant's invention as it is defined in the claims.

More specifically, there is absolutely no suggestion in the Ogawa patent of measuring the noise only at specific points in time at which at least one threshold of the receiver lying in the noise is passed through. Indeed, there is absolutely no suggestion in Ogawa of actually being able to extract an echo pulse which lies in the noise.

In conclusion, none of the prior art references relied upon by the Patent Examiner teach or suggest Applicant's invention as it is now clearly defined in the claims in which the average value of specific points in time at which a threshold lying in the noise is crossed is integrated into an amplitude function and that detection threshold is applied to that amplitude function. For that reason, Applicant respectfully submits that claims 65, 66, 67 and 68 patentably define Applicant's invention over the prior art of record and are, therefore, allowable. All remaining claims in this application depend from one of claims 65-68 and are, therefore, also allowable.

The minor objections to claims 40, 41 and 59 under 35 U.S.C. §112 have also been noted and corrected by this amendment.

For all the foregoing reasons, Applicant respectfully submits that this application is in condition for formal allowance and such action is respectfully solicited.

The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 07-1180.

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Respectfully submitted,

By _____

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